

Title Page

Title: Creating the Optimal Regulatory and Market Framework to Preserve Stream Flow and Temperature Stability in an Urbanizing Trout Stream in the Midwest

Watershed: Vermillion River, Minnesota

HUC Code: 07040001

Nominee: Vermillion River Watershed Joint Powers Organization

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Impaired Waters: Vermillion River, Lake Marion, Long Lake, Farquar Lake

Project Partners:

Vermillion River Watershed Joint Powers Organization (VRWJPO)

Friends of the Mississippi River (FMR)

Applied Ecological Services (AES)

University of Minnesota, Department of Applied Economics (U of M)

Dakota County

Scott County

Cities and Towns of the Vermillion River Watershed

Minnesota Department of Natural Resources (DNR)

Metropolitan Council

✓ Incorporates market-based approaches.

Abstract

This project will advance the goals of the Vermillion River Watershed Plan in the Twin Cities metropolitan region, Minnesota. It will create an optimal regulatory and market framework for the benefit of a nationally recognized trout stream and important amenity in an urbanizing watershed. The Watershed Plan and this project have wide public support because of the successful and open process used to develop the Watershed Plan. Today there exists a large network of partners, an established Joint Powers Organization, strong data benchmarks, established monitoring programs, and a unique combination of ongoing research and programmatic initiatives focused on the Vermillion River watershed. This will ensure that an EPA Targeted Watersheds Grant will succeed and serve as a model for other midwestern watersheds containing important natural resources, but experiencing degradation due to increasing stream flows, impervious surfaces, loss of riparian cover, and thermal pollution from existing and future development.

Introduction

The Vermillion River watershed encapsulates the multiple challenges of water quality and quantity management in the Upper Midwest. It is both rural and suburban and experiences the typical problems created by those land uses. At the same time it is a world-class trout stream. In the past decade several studies established a benchmark of overall conditions in the watershed. A critical finding was that since the 1970's, stream flow has increased disproportionately to precipitation. In 2002 the two watershed counties, Scott and Dakota, formed a joint powers board with taxing authority and a mandate to address the multiple challenges of the watershed. The Vermillion River Watershed Joint Powers Organization (VRWJPO) together with the non-profit Friends of the Mississippi River (FMR) and the Vermillion River Watershed Planning Commission held several public and technical forums beginning in 2003 to develop a watershed plan. Hundreds of citizens, 21 municipalities, state and county natural resource agencies, and other state agencies commented on the plan, released in draft in November 2004 and scheduled for approval in fall, 2005. The VRWJPO has an annual budget to complete assessments, initiate programs, and unify regulatory conditions in the watershed.

The focus of this proposal is to advance the Watershed Plan's goals by creating an optimal regulatory and market framework. Strong public and private commitment to the Vermillion River supports the continued use and revision of rules, ordinances, and zoning to create the framework and incentives in which market forces can work. Existing high quality natural resources, an agricultural legacy, growing suburbs, and the challenge of greater flows due to increasing impervious surfaces are major issues here and in other midwestern watersheds. The wide public support for watershed health, a large network of partners, an established watershed-governing body, strong data benchmarks, and an up-to-date watershed plan will

ensure that approaches developed in the Vermillion River watershed will succeed and serve as models for other watersheds in the Midwest.

The Vermillion River watershed is the largest in the Twin Cities (Minneapolis/Saint Paul) region, flowing across the south metro to the Mississippi National River and Recreation Area. Originally a meandering prairie watercourse, 80% of the watershed was actively farmed or grazed in 1940. Today Scott and Dakota are among the nation's fastest-growing counties and the watershed's population grew 40% in the 1990's. Despite this growth, the Vermillion River contains 45.5 miles of designated trout stream, considered by Trout Unlimited to be the last remaining world-class trophy trout fishery in a metropolitan area in the United States. The watershed's population is also highly dependent on groundwater use with strong surface linkages via sandy soils and porous bedrock.

The Watershed Plan identified increasing run-off volume as a future threat to watershed health. A 2002 study demonstrated that the ratio of precipitation to stream flow has decreased due to greater point discharges and impervious surfaces, added agricultural drainage, and to a lesser degree increasing rainfall. Flow volumes are expected to increase without run-off management. The river's water quality and trout population are also threatened by increasing thermal loading from point discharges and increasing impervious surfaces. The river also is impaired for fecal coliform and turbidity, however, the impairments are being addressed separately through ongoing TMDL processes. Addressing flow volume and thermal loading are the focal issues of this proposal. In brief, we propose to optimize the regulatory and market framework to preserve and improve the integrated watershed functions of flow and temperature in the context of land use and run-off treatments.

Proposed Project

The effective way to achieve water protection goals of the Watershed Plan is to address the issue of cumulative impacts resulting from increasing development and run-off discharge. Regulation on a case-by-case basis has not prevented degradation, nor is the market-approach a panacea (people fail to use it; it creates undesirable outcomes, etc.). Instead, we propose to understand the optimal regulatory and market framework that will protect the ecological health of the Vermillion River watershed—between a purely regulatory approach and a purely market-driven approach.

In the upper Vermillion, groundwater input is strong and maintains flow and water quality conditions suitable for trout. There are many wetlands and drained wetland basins. Agriculture predominates in the south and east portions, while the west and north are rapidly developing, with increased impervious surfaces and point discharges. Important objectives here are to maximize infiltration and provide suitable riparian cover.

A cap-and-trade approach for these functions will be considered in the continuum of regulatory and market frameworks. A cap can be established based on the infiltration needs of the watershed relative to the flow and water quality standards for preserving and protecting the trout stream. Discharge rates and volumes of surface run-off are used extensively in regulatory requirements of municipalities, involving stormwater modeling and NPDES permits. An institutional and regulatory framework thus exists, but must be modified and coordinated to establish a uniform market and currency under which trading can occur. One outcome of this grant will be to organize ongoing and future NPDES permits for developments and point dischargers into a single framework. Another outcome will be to incorporate flow volume into the market by creating a mechanism for trading in discharge rates tied to in-stream flow volumes for different rain events. Thermal pollution is strongly tied to surface run-off rates and flow

volume, and will be part of the trading framework. Seasonally adjusted in-stream temperature is the key response variable, with the quality of riparian cover being a tradable commodity. To refine these ideas, we will use research being conducted through a recently developed project on the Vermillion River by the University of Minnesota, the Minnesota Pollution Control Agency and the Minnesota Department of Natural Resources to determine the relationships among impervious surface, stream temperature, and precipitation. In addition, standards for run-off infiltration and thermal protection using riparian cover were issued in March 2005 in draft form as part of Minnesota's stormwater rules and will be applied to the Vermillion River watershed.

We will review the other few examples in this area of trading. We are aware, for example, of trading in thermal loading and riparian cover in the Tualatin River (Rounds and Wood, 2001). In the Minnesota River, trading exists for riparian cover and wetlands (Fang and Easter, 2003).

While land prices are higher in the developing portion of the watershed and create an incentive for trading, optimizing the regulatory and market framework will ensure that pollution hotspots are not created in the watershed, and that essential natural resource protections and amenities are not sacrificed. The assimilative capacity of the Vermillion River to increased run-off has been reached, and therefore improvements are needed, rather than a cap at a higher flow volume. We recognize there must be room under the cap to allow price optimization, and land price differences in the watershed provide opportunities for this.

The project will focus on stream flow, surface run-off discharges, impervious surface, and thermal loading. As such it will integrate four major goals of the Watershed Plan:

1. Improve water quality by managing infiltration of stormwater, establishing riparian buffers, and revising municipal ordinances, rules, etc;

2. Manage water quantity, including reducing current run-off levels, advancing research, setting standards, and writing rules and ordinances;
3. Protect groundwater and river base flow;
4. Influence land use and land management to regulate river flow and volume, and reduce thermal, non-point sediment, and nitrate loadings.

The proposed project will involve the following sequential project elements:

Evaluate the Current Regulatory Mechanisms in a Market Context

The goal of this project element is to understand how a market approach can integrate with and complement existing watershed protection mechanisms. Existing protection mechanisms, including BMPs, will be evaluated for effectiveness in a market context. This will result in proposed revisions to rules, ordinances and zoning requirements among the 21 municipalities, a necessary step in establishing a unified regulatory framework and trading system. Outreach activities (described below) will begin with this project element and continue to the project's end. The VRWJPO has partnered with Mr. Daniel Huff of the Friends of the Mississippi River since 2003 in coordinating outreach efforts for the Watershed Plan, and this project will continue that successful collaboration and build upon it.

Establish the Tradable Critical Functions of the Watershed

This project element will identify the critical functions of the watershed that exist in different geographic locations and are amenable to trading. The outcome will be a GIS-based framework to identify and quantify locations that provide stream benefits now, or could provide stream benefits in the future if additional infiltration were provided, riparian cover established, and wetlands restored. This will lay the groundwork for site-to-site trading because of greater return on investment in some portions of the watershed.

In order to understand the contribution that different locations in the watershed make to in-stream flow regulation, surface water run-off, discharge, and seasonal river flow volume will be modeled in relation to local soils, vegetation conditions, and local infiltration potential. This project will also model river flow function in terms of impervious surface utilizing research by Dr. Marv Bauer of the University of Minnesota. Dr. Bauer's methods allow up-to-date assessment and ongoing trend monitoring of impervious surfaces based on remote imagery. An inventory of riparian zone quality and location by the VRWJPO will begin in 2005 and be completed in 2006. Existing wetlands and drained wetland basins are also mapped. The Minnesota Department of Natural Resources (MNDNR) is establishing an in-stream thermal monitoring network as part of a thermal modeling initiative for the Vermillion River. This modeling is a separate project of the Minnesota Pollution Control Agency and University of Minnesota. Results will be used to understand the influence that riparian cover, impervious surface, and seasonal precipitation have on in-stream water temperature.

The VRWJPO will team with Dr. Kim Chapman of Applied Ecological Services (AES), an ecological research firm with national experience in alternative stormwater design and modeling, watershed assessments, conservation developments, and land use planning. AES will lead the assembly and analysis of data, perform flow volume and other modeling, and validate field conditions for incorporation into models and assessments. Dakota County has an extensive GIS database for the watershed, and AES has extensive in-house experience at incorporating GIS data into its watershed assessments and stormwater models. In addition, the VRWJPO has available all STORET data from the Minnesota Pollution Control Agency and holds other baseline data for use in this project.

Set Uniform Regulatory Standards and Criteria to Support Market Trading

Watershed-wide standards and criteria will be developed so that regulatory and market activities complement and enhance each other. Recommended changes to ordinances, rules, and zoning will incorporate ecological functions and establish indicators for monitoring outcomes. For example, flow volume will indicate the overall success of the regulatory and market framework. Meanwhile, discharge rate and volume will be established for specific development projects in different locations of the watershed, depending on the function of that portion of the watershed in maintaining overall watershed health.

Create a Currency for Trading Watershed Functions across the Watershed

The actual trades among private parties will determine the final value of the tradable functions, but different approaches can establish initial value (auction, assignment of value, etc.). The VRWJPO will team with Dr. Steve Taff of the University of Minnesota's Department of Applied Economics to value the watershed functions in a geographic context and model the achievable outcomes that might be realized in an optimal regulatory framework. A critical question is: Where are the high value trading opportunities for stream benefits relative to land price? The result will be a geographically-based trading framework that will be readily comprehensible so as to facilitate the widest participation in trading opportunities.

Develop the Regulatory and Market Framework for Implementation

The VRWJPO, in partnership with the 21 municipalities, will develop a programmatic approach for value trading in a regulatory framework. This will position the VRWJPO to initiate trading following the successful establishment of a regulatory and market framework in the watershed and builds upon the process the VRWJPO have used to create a Watershed Management Plan.

Monitor Critical Watershed Functions and Other Indicators

To establish a baseline and monitor the effects of this grant on future watershed functions, the VRWJPO will augment its existing network of water flow and water quality monitoring stations. There are 8 water flow and 18 water quality stations in the watershed. The VRWJPO will use the STORET and other data collected at these and other watershed locations, and 32 thermal monitoring stations are being installed in the thermally sensitive areas of the river. This will establish a 2005 baseline to measure the performance of the regulatory and market framework. It is expected that value trading in the upper watershed will result in an increasing ratio of rainfall to flow volume, increasing riparian cover, and increasing permanent cover (including wetlands), and that in-stream temperature will remain at or below the baseline, adjusted for seasonal air temperature.

Project Management

John Jaschke, Dakota County Water Resources Manager and Administrator of the Vermillion River Watershed Joint Powers Organization, will be project leader. Mr. Jaschke has 17 years experience managing and regulating water resources with the Minnesota Department of Natural Resources (DNR) and the Minnesota Board of Water and Soil Resources (BWSR). He provides staff leadership for the VRWJPO, including development of the Vermillion River Watershed Plan. During his tenure at DNR and BWSR, Mr. Jaschke was principal developer and manager of the Minnesota Wetland Ranking Program, a nationally-recognized market-driven environmental regulatory program.

Daniel Huff, Watershed Program Director, Friends of the Mississippi River will lead the public outreach initiative. Mr. Huff brings 11 years of professional experience in education, public outreach, collaboration building and water resources to the project, including outreach for the development of the Watershed Plan.

Kim Chapman, Ph.D., Principal Ecologist, Applied Ecological Services. Dr. Chapman has 25 years experience in ecological research related to environmental quality as well as extensive project experience in watershed assessments, conservation developments, and planning. He will lead the environmental research components of this project.

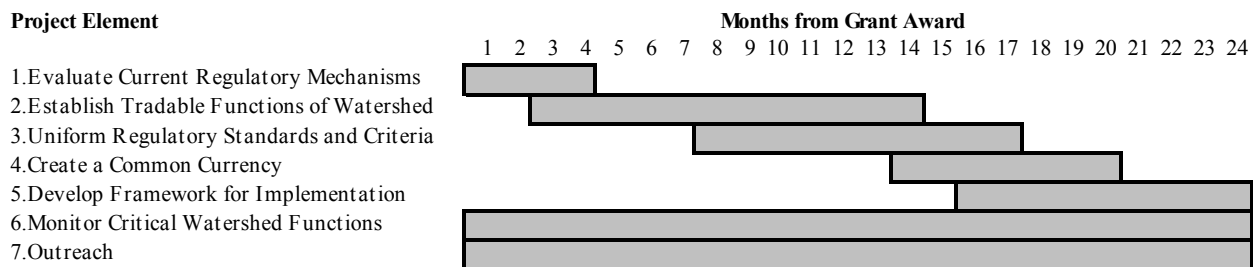
Steve Taff, Ph.D., Professor, Department of Applied Economics, University of Minnesota. Dr. Taff is a leader in land economics and conservation policy in both Minnesota and the nation. Dr. Taff pioneered and helped create the trading programs in the Minnesota River watershed (Taff and Senjem 1996). He will lead the valuation work.

Outreach Activities

To effectively engage watershed stakeholders in this project, the VRWJPO will partner with Friends of the Mississippi River (FMR), a locally based non-profit environmental organization with over ten years of conservation, stewardship and outreach experience in the Vermillion River Watershed. Initially FMR will develop watershed presentations that explain linkages between discharge, thermal loading, riparian cover, impervious surface, etc. and how a cap-and-trade system might complement the existing regulatory framework. The audience is 21 municipalities, developers, conservationists, other special stakeholders, and watershed residents. The question of acceptance of a unified permitting process will be addressed. Print and web-based materials will be developed and disseminated. At three important milestones during the 24-month project, FMR, the Watershed Board, and the citizen planning commission, will host community workshops to elicit input from stakeholders. These workshops will allow stakeholders to learn about, evaluate and comment on actual and expected project outcomes. Additionally presentations will be made to provide information but not solicit input. Once the optimal regulatory and market framework is understood, FMR will develop print and web-based materials about the project and provide guidance for future participants in the trading program.

Training will be provided to key people who will implement the program, including city, county and state agency staff involved in land-use permitting, and also developers and landowners. Additional outreach will include developing and implementing a coordinated press strategy over the length of the project. The VRWJPO also will hold regular monthly or bimonthly meetings of the citizen watershed planning commission and the Technical Advisory Group to discuss and evaluate project progress.

Project Timeline



References

Fang, F. and K. W. Easter. 2003. Pollution trading to offset new pollutant loadings: A case study in the Minnesota River Valley. *American Agricultural Economics Association, Annual Meeting*. Montreal, Canada.

Rounds, S.A. and Wood, T.M. 2001. Modeling Water Quality in the Tualatin River, Oregon, 1991-1997. *USGS Water-Resources Investigations Report 01-4041*

Taff, S. J. and N. Senjem. 1996. Increasing regulator's confidence in point-nonpoint pollutant trading schemes. *Journal American Water Resources Association* 32:1187-1193.

Table 1. Budget Information—EPA Targeted Watersheds Grant Program

Budget Summary

| Watershed Project, Activity or Work Plan Element | Federal Yr 1 | Federal Yr 2 | Non-Federal | Total |
|---|---------------------|---------------------|--------------------|--------------------|
| 1.Evaluate Current Regulatory Mechanisms | \$25,000 | | \$25,000 | \$50,000 |
| 2.Establish Tradable Functions of Watershed | \$175,000 | \$25,000 | \$75,000 | \$275,000 |
| 3.Set Uniform Regulatory Standards and Criteria | \$35,000 | \$50,000 | \$50,000 | \$135,000 |
| 4.Create a Common Currency | \$50,000 | \$125,000 | \$0 | \$175,000 |
| 5.Develop Framework for Implementation | | \$100,000 | \$50,000 | \$150,000 |
| 6.Monitor Critical Watershed Functions | \$35,000 | \$15,000 | \$50,000 | \$100,000 |
| 7.Outreach | \$40,000 | \$75,000 | \$25,000 | \$140,000 |
| Total | \$360,000 | \$390,000 | \$275,000 | \$1,025,000 |

Budget by Expense Category

| Budget Categories | Watershed Project, Activity or Work Plan Element | | | | | | | Total |
|--|--|--------------|--------------|-------------|-------------------|------------|-------------|-------------|
| | 1. Inventory | 2. Functions | 3. Standards | 4. Currency | 5. Implementation | 6. Monitor | 7. Outreach | |
| Section B - Budget Categories | | | | | | | | |
| a.Personnel | \$5,000 | \$35,000 | \$45,000 | \$15,000 | \$45,000 | \$15,000 | \$4,000 | \$164,000 |
| b.Fringe Benefits | \$2,150 | \$15,050 | \$19,350 | \$6,450 | \$19,350 | \$6,450 | \$1,720 | \$70,520 |
| c.Travel | \$2,500 | | \$2,500 | | \$2,000 | \$1,000 | \$1,000 | \$9,000 |
| d.Equipment | | \$14,000 | | | | \$20,000 | \$2,000 | \$36,000 |
| e.Supplies | | | | \$0 | \$2,000 | \$5,000 | \$8,000 | \$15,000 |
| f.Contractual | \$25,000 | \$125,000 | \$25,000 | \$100,000 | \$35,000 | \$22,000 | \$80,000 | \$412,000 |
| g.Construction | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| h.Other | | | | | | | | \$0 |
| i.Total Direct Charges (sum line a-h) | \$34,650 | \$189,050 | \$91,850 | \$121,450 | \$103,350 | \$69,450 | \$96,720 | \$706,520 |
| j.Indirect Charges | \$15,617 | \$85,205 | \$41,397 | \$54,738 | \$46,580 | \$31,301 | \$43,592 | \$318,429 |
| Totals (sum line i-j) | \$50,267 | \$274,255 | \$133,247 | \$176,188 | \$149,930 | \$100,751 | \$140,312 | \$1,024,949 |

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